4/PRTS

TITLE

Pusher apparatus for merchandise

DESCRIPTION

Technical field

The invention relates to the field of pusher apparatus, i.e. apparatus for pushing a stack of items along a track. The main application for pusher apparatus is in merchandising of items for sale, whereby the front item of the stack of merchandise is always pushed to the front of the shelf. Pusher apparatus according to the invention may also operate vertically or at other angles and words such as "front", "forwards" and "backwards" in this specification are not intended to limit its scope to horizontal operation. Pusher apparatus may clearly also be used in other situations where items are to be dispensed to a user, not necessarily for sale.

Background

It is known to use a pusher apparatus for automatically pushing items of merchandise to the front of a shelf, where they are more readily visible and accessible to a potential purchaser. This may particularly promote one type of merchandise, which is stacked on a pusher apparatus and therefore prominent at the front of the shelf, over adjacent merchandise that remains at the back of the shelf.

A known pusher apparatus comprises a pusher unit that slides on a track. The pusher unit may be guided along the track by rails. The pusher unit is retracted against the force of a spring so that a stack of merchandise can be placed along the track. When the pusher unit is released, it urges the stack forwards until the front item of merchandise comes to rest against a lip at the front of the track. As each item of merchandise is removed, the remaining stack is urged forwards until the next item rests at the front of the track. Known springs in such pusher apparatus either have a concertina shape with one end attached to the back of the track and the other end attached to the pusher unit to push the pusher unit forwards; or have a coiled configuration with one end attached to the front of the track and the other end attached to the pusher unit to pull the pusher unit forwards.

The known pusher apparatus suffers various problems. One is that of "racking". If the merchandise being pushed is not centred on the pusher plate, there is a tendency for the pusher unit to cant to one side as it moves forwards. That can cause the pusher unit to wedge against the rails of the track, preventing further forward movement. The wider the pusher plate is, the greater is the potential turning moment of an off-centre load. This provides a practical limit to the width of the pusher plate and the size and weight of the merchandise that can be stacked on the apparatus.

In the prior art, the speed of the pusher has also been a problem. The spring must be strong enough to push a full stack of merchandise against the force of friction between the stack and the track. When the same spring is acting on only a few items in the stack, it can accelerate them violently and push them too rapidly along the track. There is a risk of injury to the fingers of a person who is loading the apparatus. There is also a risk that the rapidly moving items will be ejected from the front of the stack, causing them to fall and be damaged. To avoid the latter risk, the height of the retaining lip at the front of the track must be increased, which makes the items less visible and less accessible and requires a greater space above the shelf so that items can be lifted over the lip.

Known pushers have been found not to work well in cold environments such as chiller or freezer cabinets. There is a problem with the build up of frost along the track, which impedes the sliding movement of the pusher unit. There is also a problem of ice adhering the pusher unit to the track.

Summary of the invention

The invention provides pusher apparatus comprising: a track; a pusher mounted on the track for movement along the track; a spring mounted on the pusher for urging the pusher along the track; an axle rotatably mounted on the pusher; and at least one wheel fixed to the axle for positively engaging the track.

Preferably, the track includes at least one line of slots or teeth along the track; and wherein each wheel is a cog bearing teeth for positively engaging the slots or teeth of the track.

In a highly preferred embodiment, at least two wheels are fixed to the axle for simultaneous rotation. Because the two wheels positively engage the track, the two ends of the axle can only move simultaneously and the two sides of the pusher unit must advance in step along the track. Therefore the pusher unit does not cant to either side and the problem of racking is solved. To prevent relative rotational movement of the two wheels, the material of the axle must be sufficiently stiff under torsional stresses. For ordinary small and lightweight applications, plastics materials should suffice but for pushing heavy items with a wide pusher plate a stronger material such as steel may be required.

The spring may be a coil spring. In a preferred embodiment, the spring is coiled about the axle, one end of the spring being secured to the axle and the other end of the spring being attached to the pusher, whereby the coiling or uncoiling of the spring drives rotation of the axle. In this embodiment, the spring can be contained entirely within the housing of the pusher unit, where it is hidden from view and also protected from dirt that may accumulate on the track. The pusher may be started from any point on the track then retracted and, as the spring unwinds, it will naturally return to its starting point.

In an alternative preferred embodiment, a first end of the coil spring is attached to a front end of the track and the second end of the spring is attached to the pusher, whereby the coiling of the spring draws the pusher along the track. In this embodiment the pusher is started from a fixed point at the end of the track and its forward movement ends when it returns to the fixed point. That is not necessarily when the spring is in a fully relaxed condition, which has the advantage that the spring may still provide a useful driving force even near the end of the track. The same embodiment may further comprise a second axle rotatably mounted on the pusher, wherein the spring is coiled about the second axle and the second end of the

spring is attached to the second axle. By using separate axles for mounting the spring and the cogs, each axle can be designed optimally for its own function and it is not necessary to ensure that the number of turns on the spring matches the number of turns of the cogs.

As an alternative, the coil spring need not be mounted on an axle, provided that it is constrained to coil appropriately within a suitable housing.

The spring does not have to be located centrally on the track and if there is an independent spring axle, the independent axle need not be parallel to the gear axle. For example, the spring axle can have a vertical axis and the spring can run along a side wall of a channel in which the track is located.

The gear axle does not have to be perpendicular to the length of the track. With an oblique gear axle, each individual slot should extend parallel to the gear axle to accommodate a component of motion of the gear tooth parallel to the axle as the pusher slides along the track.

It is strongly preferred that the pusher apparatus comprises a rotary damper mounted on the pusher for regulating the rate of coiling or uncoiling of the spring. The damper allows the use of a spring strong enough to move the largest loads expected when the stack is full but prevents the pusher from moving too fast when only a light load is present. Therefore the problems of potential injury and of spilt merchandise are avoided. The damping effect of the rotary damper may be adjustable so that a single design of pusher apparatus can accommodate merchandise of widely differing weights. Other kinds of damper such as a linear damper arranged along the track could also be used.

The pusher apparatus preferably includes a latch for retaining the pusher at a desired position along the track, so that the operator can have both hands free when loading a stack of merchandise. The latch may be releasable by trigger means located at the

front end of the track. Alternatively, the latch may be releasable by applying rearward pressure to the pusher.

The drawings

Figure 1 shows a pusher apparatus according to a first embodiment of the invention in vertical cross section on line I-I of Figure 2.

Figure 2 shows the pusher apparatus of Figure 1 in plan view, sectioned along line II-II of Figure 1.

Figures 3 and 4 show the pusher apparatus of Figure 1 in a perspective view and illustrate the operation of the latch mechanism.

Figure 5 shows in perspective view a pusher apparatus according to a second embodiment of the invention.

Figures 6, 7 and 8 show the pusher apparatus of Figure 5 in plan view, side view and end view respectively, each view having part of the housing cut away to reveal the interior.

Detailed description of the preferred embodiments

The pusher apparatus shown in Figures 1 to 4 comprises an elongate track 2, which in use rests on or is integral with a shelf (not shown) for displaying merchandise. A pusher unit 4 is mounted on the track 2 so as to be capable of sliding along the track 2. Merchandise 6 for display is stacked along the track 2 and is engaged by a pusher plate 8 of the pusher unit 4.

A coil spring 10 is coiled about a spring axle 12 that is rotatably mounted in the pusher unit 4, one end of the spring being attached to a ring (not shown) freely rotatable on the spring axle 12. The other end of the spring is attached at 14 to the track 2, near to the front end of the track 2. As the pusher unit 4 is drawn back along the track to the position shown in Figure 1, the spring 10 uncoils and lies flat along the track 2. The natural tendency of the spring 10 to coil up again draws the pusher unit 4 forwards along the track 2, pushing the items of merchandise 6 on the track ahead of it, until the front item engages a lip 16 at the front end of the track 2. When the front item of merchandise is removed from the shelf, the spring 10 is free to re-

coil further and the pusher plate 8 pushes the remaining stack of merchandise 6 forwards until the next item rests against the lip 16 at the front of the track 2.

A gear axle 20 is also mounted in the pusher unit 4 so as to be freely rotatable. Fixed to the gear axle 20 are two cogs 22, which therefore rotate simultaneously when the gear axle 20 rotates. When the pusher unit 4 rests on the track 2, the teeth of each cog 22 engage a line of slots 24 in the track in a rack-and-pinion arrangement. As shown, the ends of the cog teeth are rounded to engage with rectangular slots 24. However any suitable shape of cog teeth may be used with complementary teeth or slots in the track, as is well known. Because the two cogs 22 are connected together by the rigid gear axle 20, the two sides of the pusher unit 4 must move forwards simultaneously and the pusher unit 4 is unable to cant to one side, which caused the racking problem in the prior art. Because of this resistance to racking, the pusher plate 8 in the apparatus of Figures 1 and 2 can be considerably enlarged and the apparatus can be used for bulky and heavy items of merchandise 6.

Rotation of the gear axle 20 is controlled by a rotary damper 18 mounted in the pusher unit 4. The rotary damper 18 is preferably a one-way damper so that the pusher unit 4 may be easily retracted for filling the shelf but the forward movement of the pusher unit 4 under the influence of the spring 10 is controlled by the damper 18. The damping level of the rotary damper 18 should be selected so that when the shelf is full and the spring 10 is fully stretched, the merchandise 6 does not move forwards at too high a speed, which might cause it to tip over the lip 16 at the front of the track 2. On the other hand, the spring 10 must be able to overcome the resistance of the damper 18 and the friction of the moving parts against the track 2 in order to move the final item of merchandise 6 when the spring 10 is almost fully coiled and at its weakest. The rotary damper 18 acts by a viscous fluid which resists the movement of vanes or valves (not shown) driven by rotation of the gear axle 20. If the pusher apparatus is to be used in a cold environment such as a freezer, the fluid becomes more viscous and the damping effect is increased.

The pusher apparatus is also provided with a latch, which holds the pusher unit 4 at the retracted position (shown in Figure 3) along the track 2, against the bias of the spring 10, to allow for ease of filling the shelf with merchandise 6. The latch 26 is connected by a rod 28 running beneath the track 2 to a trigger 30, by which the latch 26 may be released (as shown in Figure 4) to allow the pusher unit 4 to move along the track 2..

An alternative latch (not illustrated) may be a double-action latch fixed to the rear end of the track 2. When the pusher unit 4 is first pushed back against the latch, it latches and holds the pusher unit stationary against the bias from the spring 10. The pusher unit 4 may be pushed back a second time to release the latch. A still further alternative (not illustrated) may be to mount the latch entirely on the pusher unit 4. However, that is then more difficult to access when the pusher unit 4 is retracted and the shelf is full of merchandise.

Another embodiment of the invention, which is better suited to small and lightweight merchandise such as cigarette packets, is illustrated in Figures 5 to 8. A track 52 of π-shaped cross section may be mounted in a channel or between walls on a shelf (not shown) where merchandise is to be displayed. A pusher unit 54 is mounted so as to be slidable along the track 52. The pusher unit 54 has lugs 56 for engaging flanges 58 on the track 52 to prevent the pusher unit 54 from being lifted off the track 52.

Mounted for rotation in the pusher unit 54 is an axle 60. One end of the axle 60 engages a rotary damper 62 and the other end engages a bearing 64. Fixed to the axle 60 is a cog 66. When the pusher unit 54 is mounted on the track 52, the teeth of the cog 66 engage a line of slots 68 along the track 52 in a rack-and-pinion arrangement. As shown, the ends of the cog teeth are rounded to engage with rectangular slots 68. However any suitable shape of cog teeth may be used with complementary teeth or slots in the track, as is well known.

A coil spring 70 is coiled around the axle 60. One end of the coil spring is fixed to the axle 60 and the other end to a mounting 72 on the housing of the pusher unit 54.

Thereby, when the spring 70 coils or uncoils, the axle 60 rotates within the pusher unit 52 in the manner of a clockwork mechanism. The rate of rotation of the axle 60 is controlled by the rotary damper 62.

In use, the pusher unit 54 is mounted at the front end (not shown) of the track 52 with the coil spring 70 in its relaxed state. The pusher unit 54 is then pushed back along the track 52 causing the cog 66 to rotate the axle 60 and coil the spring 70 more tightly. A stack of merchandise items may then be placed on the track 52 in front of the pusher unit 54 and behind a front product stop (not shown). The product stop may be integral with, attached to or adjacent to the track 52. When the pusher unit 54 is released, the spring 70 attempts to uncoil and it urges the pusher unit 54 forwards along the track 52 until the front item of merchandise rests against the product stop at the front of the track 52. As each item of merchandise is removed, the spring 70 uncoils further and the pusher unit 54 moves the stack of merchandise forwards so that an item is always presented at the front of the shelf. When the last item is removed and the pusher unit 54 reaches the front of the track 52 once more, the coil spring 70 is then back in its relaxed state and the forward movement ceases.

This embodiment of the invention is capable of working with tracks that bend upwards or downwards or (within certain limits of curvature) sideways, which may allow the design of attractive and unusual merchandising displays.

One or more hybrids between the two illustrated embodiments of the invention are also possible. For example, the spring 70 contained wholly within the pusher unit 54 of the second embodiment may be combined with the twin cogs 22 and track 2 of the first embodiment to resist racking. In that case, the cogs 22 and the spring 70 will share a common axle.